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Effect supplementation of turmeric powder (*Curcuma longa* L.) on histomorphometric duodenal female *Melopsittacus undulates*

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Abstract. Turmeric powder supplements contain curcumin and essential oils that can increase parakeet production. The aims study to analyze effect supplementation turmeric powder (*Curcuma longa* L.) on duodenal female parakeets (*Melopsittacus undulates*). This research used ten female parakeets aged four months. Research used a randomized design complete with two treatments and five replications. The treatment was P1 as control and P2 with supplement turmeric powder dose 35 mg/bird/day for 30 days. The result using t-test showed that effect turmeric powder did not make significant ($p > 0.05$) on body weight, feed consumption, gastrointestinal length, and duodenal histomorphometry (villi height, villi width, crypt depth, and mucosal muscular thickness). The conclusion is supplementation turmeric powder on female parakeets (*Melopsittacus undulates*) not effect on body weight, feed consumption, gastrointestinal length, and duodenal histomorphometry (villi height, villi width, crypt depth, and mucosal muscular thickness). Supplementation turmeric powder dose 35 mg/bird/day not positive impact on the digestive system of parakeets.

1. Introduction

Feed is an important thing to support livestock success. Feeds that contain complete nutrients are needed to produce better products. The ability of livestock to digest food is characterized by the efficiency of feed that can be absorbed by the digestive tract. The efficiencies in utilizing feed can be seen from the performance of poultry such as body weight, feed consumption, mortality and productivity [1].

Parakeets (*Melopsittacus undulates*) have a curved beak and consist of 350 species in the order Psittaciformes with a worldwide distribution. Parakeets also commonly called budgerigars or budgies. Parakeets are often owned as pets in cages and often praised for their songs and beautiful plumage colors, such as green, yellow, blue-white, and white-black [2]. The popularity of parakeets as pet birds has led to high commercial prices for these birds so that many chirping bird lovers are attracted to cultivation [3].

Parakeet breeding business becomes a promising business, but in captivity, there are often obstacles such as malnutrition, hatching failure and mortality [4]. Maintenance management is needed, one of them is supplementation. Giving a turmeric powder supplement is expected to help the digestive process so that it can increase parakeet production [5]. The parakeet's intestine is a place of digestion and absorption feed. Supplements can increase appetite, thus affecting feed consumption. This change will affect the histology structure of the small intestine, especially in the duodenal villi that are useful for food absorption [6]. Turmeric powder supplement can increase duodenal villus



growth. Turmeric powder contains many chemical compounds, such as curcumin and essential oils. The active compound content is 3-4% curcumin and 5.8% essential oil — pharmacological activities of curcumin such as antioxidants, anti-inflammatory and antibacterial [7]. Curcumin is an antioxidant compound in turmeric which can delay and slow down the oxidation reaction so that it can counteract free radicals. The function essential oils in turmeric are to improve digestive processes and stimulate the production of digestive enzymes so that the results of metabolism are absorbed a lot [8]. The metabolic process produces energy that can be used for growth and including reproduction [9].

Turmeric powder supplement can increase quail appetite at a dose of 108 mg/bird/day with a body weight of 90 g. The dose can also improve liver function and feed metabolism [10]. Supplements turmeric powder of 200 mg/kg/day in chickens increased histomorphometric intestine. The increasing growth of duodenal villi causes more protein absorption so that it can affect feed consumption and body weight [6]. Based on introduction, this study aims to analyze effect supplementation turmeric powder (*Curcuma longa* L.) on histomorphometric duodenal female parakeets (*Melopsittacus undulates*).

2. Material and Method

2.1. Bird Treatment

This study used ten female parakeets aged four months. Parakeets are divided into two treatments and five replications. P1 as control and P2 with a supplement of turmeric powder with a dose of 35 mg/bird/day for 30 days. This research is a preliminary study to find out the effect of giving turmeric powder supplements.

2.2. Parameters studies

The parameters of this study were body weight, feed consumption, gastrointestinal length and a histomorphometric duodenal female parakeet (villus height, villus width, crypt depth, and mucosal muscularis thickness).

2.3. Measurement Parameters

Data collection on body weight is taken from the final body weight of the treatment. Feed consumption is calculated by calculating the difference between the total feed given with the remaining feed. The length of the digestive tract is calculated using a 30 cm ruler of 1 mm thickness. Duodenal histology preparations female parakeets using paraffin method and staining using hematoxylin-eosin (HE). Measurement of duodenal histomorphometric female parakeets using an Olympus BX51 microscope with 10x10 magnification equipped with DP2-BSW computer software connect to a photomicrograph. Measurement of villus height was done from the tip of the villus to the crypt junction. Measurement of villus width was carried out in the middle villus. Measurement of crypt depth was measured from crypt junction to the base crypt. Measurement of mucosal muscularis thickness was carried out from the basement membrane of the crypt to the muscularis mucosa [6].

2.4. Statistical analysis

The data were analyzed using the t-test to see the difference in average parameters between the control group (P1) and the treatment group (P2) with a significant level of 5%. Statistical analysis using Statistical Product and Service Solution (SPSS) version 16.0 software program.

3. Result and Discussion

3.1 Effect supplementation turmeric powder on body weight, feed consumption, and length of digestion tract female parakeet.

Results of body weight, feed consumption, and length of the female parakeet digestive tract can be shown in Table 1.

Table 1. Results of body weight, feed consumption, and length of the digestive tract female parakeets.

Parameters	P0		P1		P t-test
	N	Mean±St.Dev	n	Mean±St.Dev	

Body Weight (g)	5	32.80±2.280	5	35.60±3.847	0.199
Feed Consumption (g)	5	2.69±0.468	5	2.91±0.264	0.404
Length Digestive Tract (cm)	5	16.80±1.753	5	19.50±3.342	0.148

Note: No significant difference in the significant level of $P > 0.05$

The result shows that effect supplementation turmeric powder on body weight female parakeet using t-test showed no significant difference ($p > 0.05$). The average body weight female parakeets are 32.80-35.60 g (Table 1.). The average normal weight of parakeets ranges from 30-80 g [11]. Factors that affect the body weight on parakeets not significantly affected is feed consumption. Body weight gain is related to feed consumption. Body weight will increase if feed consumption increases, but the consumption of feed from this study is not significantly different. Curcumin and essential oils in turmeric powder supplement can increase appetite, but the results of research not significantly different on body weight. It is suspected that experience stress, due to oral administration of turmeric powder [12]. Another research that curcumin and essential oils did not absorb effectively by the epithelial cells of the intestine, so it does not affect the metabolism of the digestive tract [13].

The Result shows that effect supplementation turmeric powder on feed consumption of female parakeets using the t-test showed no significant differences ($P > 0.05$). The average feed consumption female parakeets were 2.69-2.91 g (Table 1.). The average normal feed consumption in parakeets ranges from 2.6-3.4 g/bird/day [14]. Supplements turmeric powder does not change the taste of feed, so it does not change palatability. Parakeets tongue has a taste system in the form of gustative or taste buds to recognize the taste of food and motivate feed intake. Parakeets tongue receives its food influenced by the perception of the form, taste, texture, smell, and temperature that is felt after entering the mouth. The number of poultry taste points is small compared to other animals, but the sensitivity is high [15]. Supplements turmeric powder in quail dose 54 mg did not affect feed consumption [16].

Another factor that affects feed consumption is environmental conditions. The average room temperature during the study was 30 °C and humidity was 63.6%. The environmental conditions under normal conditions for survival of parakeets include temperatures of 17-24 °C and humidity 60-70% [17]. Environmental temperature conditions can affect the metabolic activity of parakeets. If the temperature rises, the need for water increases, this affects the physiological conditions of the parakeet to increase evaporation of the skin. Birds do not have sweat, to maintain the balance of body temperature through heat release. The release of heat from the body of avian is done by sensible heat loss is the loss of body heat through radiation, conduction, and convection. Insensible heat loss is the loss of heat through the body. Panting is a process of evaporation heat dissipation by performing oscillation vibrations through the respiratory tract and is the main mechanism of heat release at high ambient temperatures [18].

The result shows that effect supplementation turmeric powder on length digestive tract female parakeet using the t-test showed no significant differences ($P > 0.05$). Average feed consumption in control parakeets 16.80-19.50 cm (Table 1.). The growth of the digestive tract organs is affected by age, feed, and body weight. Turmeric powder supplement does not affect in length of digestive tract because age, body weight, and feed consumption relative same, so the ability to absorb nutrients same. The rate of growth of the digestive tract of poultry occurs when hatching up to the age of 6 weeks, after which the growth gradually decreases and even at some point stop [19].

3.2 Effect supplementation turmeric powder on histomorphometric duodenal female parakeets

Results of body weight, feed consumption, and length of the female parakeet digestive tract can be seen in Table 2.

Table 2. The result of histomorphometric duodenal female parakeet

Parameter	P0		P1		P t-test
	n	Mean±St.Dev	n	Mean±St.Dev	
Villus Height	5	85.57±14.506	5	87.75±23.476	0.864
Villus Width	5	21.06±3.555	5	24.54±3.469	0.156

Crypt Depth	5	30.86±5.731	5	24.25±6.100	0.115
Mucosal Muscularis Thickness	5	3.34±1.016	5	2.90±0.369	0.382

Note: No significant difference in the significant level of $P > 0.05$.

The result shows that effect supplementation turmeric powder on histomorphometric duodenal female parakeets including villus height, villus width, crypt depth and muscularis mucosal thickness using t-test showed no significant differences ($P > 0.05$). The average villus height was 85.57-87.75 μm , villus width of 21.06- 24.54 μm , crypt depth of 24.25- 30.86 μm and muscularis mucous thickness of 2.90 - 3.34 μm (Table 2.). The results of duodenal histology female parakeets using hematoxylin-eosin (HE) staining with a magnification of 10X can be seen in Figure 1.

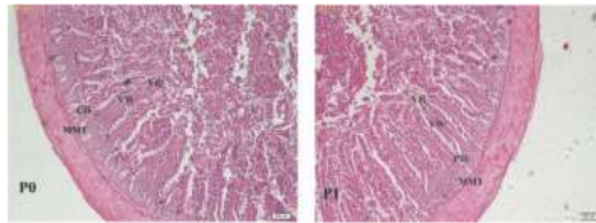


Figure 1. Histology duodenal female parakeets with HE 10X, P0: Control and P1 staining: Turmeric Powder Supplements 35 mg/bird/day; villi height (VH), villi width (VW), crypt depth (CD), and muscularis mucosa thickness (MMT).

The increase in villus height and villus width in the duodenal female parakeet because of turmeric powder supplement containing curcumin and essential oil, although it has not been significantly affected in this study. Increase in villus height and villus width in the duodenal is related to the expansion of absorption areas in the digestive processes and feed absorption. It is an illustration of smooth transportation throughout the body [6]. The digestion process and food absorption influenced by the surface area of the intestinal epithelium, the number of folds, the number of villi and villi height and villi width that expand the absorption of nutrients [20]. The intestinal epithelial cells change constantly and compensate villi cells losses through proliferation and maturation inside crypts and upward migration. The crypt depth correlates with the renewal of villus due to inflammation. Crypt depth was lower in turmeric powder supplement in parakeets because there is no inflammation and no need to renew villus [21]. The muscularis mucosa consist of layers of smooth muscle fibers occurs in a longitudinal smooth muscle layer some smooth muscle fibers extend inside the villi. Curcumin and essential oil can increase net energy to maintaining the luminal tissue at the expense of more productive purposes such as muscle accretion, but turmeric powder in this research does not impact in muscularis mucosa thickness [22].

4. Conclusion

Supplementation turmeric powder (*Curcuma longa* L.) at a dose of 35 mg/bird/day no significant effect on body weight, feed consumption, gastrointestinal length, and duodenal histomorphometry (villus height, villus width, crypt depth, and muscular mucosal thickness).

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